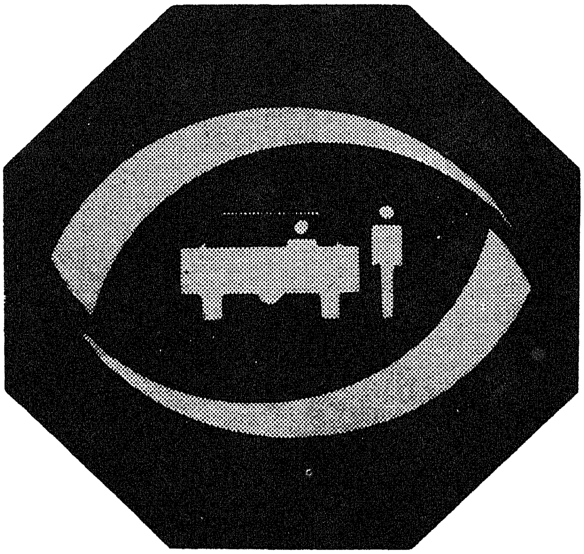
72-24

HSL No. 72-24 December 15, 1972 HS-011 916 — HS-011 989, HS-800 536; 577; 578; 697, HS-810 228; 231

An Announcement of
Highway Safety Literature
. . . A Bi-Monthly Abstract Journal

HSL No. 72-24
December 15, 1972



SPECIAL ANNOUNCEMENT ON PAGE 22

THIS ISSUE CONTAINS

HS-011 916 — HS-011 989
HS-800 536; 577; 578; 697
HS-810 228; 231

U.S. Department of Transportation / National Highway Traffic Safety Administration

[redacted]

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. . . A Bi-Monthly Abstract Journal

Published twice-a-month by the National Highway Traffic Safety Administration,
Office of Administration
Washington, D.C. 20590

INTRODUCTION

Publications such as journal articles, proceedings, and research reports announced in *Highway Safety Literature* include some of the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 72 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series). NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-820 000 series are available for, purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array	Fld. 5/21; 5/9
NHTSA Accession no	HS-800 218
Title of document	AN INVESTIGATION OF USED CAR SAFETY STANDARDS--SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L
Personal author(s)	by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams
Corporate author	Operations Research, Inc.
Collation	150p
Publication date	1969
	Contract FH-11-6921
	Report no. ORI-TR-553-Vol-6; PB-190 523
Abstract	Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.
	Search terms; Wear; Trucks; Failures; Used cars; Inspection standards
	AVAILABILITY: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT–THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation .... Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

(Note: If the date of a report or Journal article is not given, the small letters nd will appear)

TABLE OF CONTENTS

NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1, and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

INTRODUCTION AND
SAMPLE ENTRIES .... Inside Front Cover
AVAILABILITY OF DOCUMENTS ii

NHTSA SUBJECT FIELDS AND GROUPS

1/0 ACCIDENTS 1
- /1 Emergency Services (11, 15-16)
- /2 Injuries
- /3 Investigation (10, 14-15)
- /4 Locations (9, 14)
- /5 Statistical data

2/0 HIGHWAY SAFETY 5
- /1 Breakaway Structures
- /2 Communications
- /3 Debris Hazard Control and Cleanup (15-16)
- /4 Design and Construction (12, 14)
- /5 Lighting (14)
- /6 Maintenance (12)
- /7 Meteorological Conditions
- /8 Police Traffic Services (15)
- /9 Traffic Control (13-14)
- /10 Traffic Courts (7)
- /11 Traffic Records (10)

3/0 HUMAN FACTORS 7
- /1 Alcohol (8, 14)
- /2 Anthropomorphic Data
- /3 Cyclists
- /4 Driver Behavior
- /5 Driver Education (4, 14)
- /6 Driver Licensing (5, 10, 14)
- /7 Drugs Other Than Alcohol
- /8 Environmental Effects
- /9 Impaired Drivers
- /10 Passengers
- /11 Pedestrians (14-15)
- /12 Vision

4/0 OTHER SAFETY-RELATED AREAS 9
- /1 Codes and Laws (6)
- /2 Community Support (17)
- /3 Cost Effectiveness
- /4 Governmental Aspects
- /5 Information Technology
- /6 Insurance
- /7 Mathematical Sciences
- /8 Transportation Systems

5/0 VEHICLE SAFETY 10

* All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.

- /1 Brake Systems (102, 105-6, 116)
- */2 Buses, School Buses, and Multipurpose Passenger Vehicles (102-4, 106-8, 111-3, 116, 205-6, 209, 211)
- */3 Cycles (3; 108, 112, 116, 205)
- /4 Design (14; 101-2, 105, 107, 201)
- /5 Door Systems (201, 206)
- /6 Fuel Systems (101, 301)
- /7 Glazing Materials (205)
- /8 Hood Latch Systems (113)
- /9 Inspection (1)
- /10 Lighting Systems (101, 105, 108, 112)
- /11 Maintenance and Repairs
- /12 Manufacturers, Distributors, and Dealers
- /13 Mirrors and Mountings (107, 111)
- /14 Occupant Protection (15; 201-4, 207-10)
- /15 Propulsion Systems
- /16 Registration (2, 10)
- /17 Safety Defect Control
- /18 Steering Control System (101, 107, 203-4)
- /19 Theft Protection (114-5)
- */20 Trucks and Trailers (102-4, 107-8, 112-3, 116, 205-6, 209)
- /21 Used Vehicles
- /22 Wheel Systems (109-10, 211)
- /23 Windshield-Related Systems (101, 103-4, 107, 205, 212)

NHTSA DOCUMENTS 20

NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U.S. Department of Transportation, National Highway Traffic Safety Administration.

AVAILABILITY OF DOCUMENTS AND INSTRUCTIONS FOR ORDERING

Articles and reports whose citations and abstracts appear in HSL are acquired from many sources, such as periodicals, journals, NHTSA Contractors' reports and NHTSA staff speeches, and other reports. Those reports other than NHTSA Contractors' reports and NHTSA generated reports and speeches (see introduction) are assigned a lower consecutive accession (HS-) number.

Department of Transportation personnel may borrow copies of publications announced in HSL from the NHTSA Technical Reference Division. Non-DOT Personnel, in the Washington, D.C. area, may borrow copies of publications for a 24-hour period only. Telephone (202) 426-2768. Government personnel in the Washington, D.C. area, use government ID phone 118-62768.

The names of the journals cited in HSL appear in *italic type* preceded by the words "Published in." The journal containing the article cited may be borrowed from most research and public libraries. Non-DOT personnel outside the Washington area should contact their company or agency libraries for assistance.

(Use any of the most recent *periodical directories* for location and price of publications cited in HSL)

NHTSA Contractors' reports and other reports can usually be obtained as indicated under AVAILABILITY. However, there is no certainty that copies will be available for more than a limited period after a report is issued.

The more common availability sources are identified by symbols which are explained in the next column:

NTIS: National Technical Information Service, Springfield, Va. 22151. Order by accession number: HS, AD, or PB. Prepayment is required by NTIS coupon, check or money order (made payable to NTIS). GPO coupons are not acceptable. Documents are available in paper copy (PC); in full size original or reduced facsimile, and on microfiche (MF) a 4x6" negative sheet of film (reader required).

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number. Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20590 (Telephone (202) 426-0874), Give HS-No.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a $1 handling charge.

IMPORTANT NOTICE

WHEN REQUESTING a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS, add DOT/to the prefix HS-; example HS-800 000 should be ordered as DOT/HS-800 000.

1/0 ACCIDENTS

1/1 Emergency Services

HS-011 916 Fld. 1/1

THE DESIGN OF AMBULANCES

by P.S. London

Published in *Institution of Mechanical Engineers Proceedings* v182 pt2A n7 p188-99 (1967-68)

4refs

Although only about 5% of the work of ambulance services concerns emergency cases, it is the seriously ill or injured patients that pose the most difficult problems in design. Much of this difficulty springs from the fact that only a few hundred ambulances are required each year, which means that vehicles produced as a result of special research and design would be very expensive. Ambulances should be designed to eliminate jolts without causing nauseating swaying; to provide a vehicle in which a stretcher trolly can be firmly fixed either in the center of the vehicle or along each side; to provide the storage space for necessary medical and some light rescue equipment; to provide easy entry for stretcher trolleys at the rear and easy passage between the crew and patient compartments. Ideally, the suspension should be appropriate for a load of two crew, two stretcher patients, and necessary equipment.

Search terms: Ambulance design; Accessibility; First aid equipment; Stretchers; Transportation of injured

HS-011 917 Fld. 1/1; 4/3

WHAT HAPPENS AFTER THE ACCIDENT?

by F.J. Wegmann; W.D. Wyant; R. Jordan, Jr.

Published in *Traffic Quarterly* v26 n2 p299-314 (Apr 1972)

11refs

This paper discusses the problem of the time separation between recognition of an accident and the initiation of definitive medical aid. Excessive time delays are encountered because of roadway alignment, traffic congestion, inclement weather, etc. It is proposed that helicopters, proven to be critical in reducing battlefield death rates, be utilized for transporting accident victims. Helicopter-ground communications are essential in alerting emergency rooms of the patient's expected arrival. Cost effectiveness of helicopter ambulances is discussed. Their use in rural areas is urged.

Search terms: Helicopter ambulances; Emergency medical services; Transportation of injured; Communication systems; Benefit cost analysis; Time factors; Accident survival time; Accident survivability; Rural areas

1/2 Injuries

HS-011 918 Fld. 1/2

PROTECTION OF THE BRAIN FROM INJURY DURING IMPACT: EXPERIMENTAL STUDIES IN THE BIOMECHANICS OF HEAD INJURY

by A.K. Ommaya; A.E. Hirsch

National Inst. of Neurological Diseases and Stroke; National Hwy. Traf. Safety Administration

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 p7-(1-19)

37refs

Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

This paper summarizes experimental data on head injury in three sub-human primate species undergoing controlled direct head impact and indirect impulsive head loading (whiplash). Detailed testing of Holbourn's rotational hypothesis and the translation/cavitation hypothesis revealed considerable discrepancies. Data are presented to show that a combination of head rotation and skull distortion mechanisms are most injurious for brain damage during both direct and indirect impact. No evidence is found that short duration pure translation or linear acceleration of the head is at all injurious to the brain. A method for scaling such sub-human primate data to predict injury thresholds for man is given. Current mathematical models with simultaneous experimental testing in development are reviewed.

Search terms: Brain injuries; Whiplash injuries; Head impact tolerances; Skull fractures; Animal impact tolerances; Brain concussion; Monkeys; Head protection; Animal acceleration tolerances; Animal experiments; Mathematical models; Injury research; Biomechanics; Head motion range; Impact angle; Mathematical models

1/3 Investigation

HS-011 919 Fld. 1/3

MULTI-DISCIPLINARY INVESTIGATIONS TO DETERMINE AUTOMOBILE ACCIDENT CAUSATION. REPORT NO. 1, ORGANIZATION AND METHODOLOGY OF INTENSIVE ACCIDENT INVESTIGATION. TECHNICAL REPORT

by K.J. Tharp; J.W. Garrett

Cornell Aeronautical Lab., Inc.

1968 115p
Report no. CAL-VJ-2224-V-1

Sponsored by Automobile Manufacturers Assoc. under Memorandum Agreement No. FP-10.

1/3 Investigation (Cont'd.)

HS-011 919 (Cont'd.)

There has been considerable criticism of the current accident report forms by those interested in reducing the toll of injury and death on our highways. The research in this report has been directed to reducing these deficiencies by working toward three major objectives: obtain data on the factors which cause accidents; develop and explore new techniques and methods for obtaining research data on accidents; and develop procedures and techniques for handling and analyzing the mass of data obtained from intensive accident investigation. Investigating teams studied accidents in three towns in the Buffalo, New York area. Drivers and witnesses were interviewed, vehicles examined, and the environment studied. Driver, vehicle, and highway variables associated with accidents are discussed.

Search terms: New York (State); Accident report forms; Accident causes; Accident research; Accident analysis; Driver interviews; Data acquisition; Damage severity index; Multidisciplinary teams; Environmental factors; Time of day; Time of accidents; Injury severity index; Day of week; Accident case reports; Photography; Accident investigation; Accident case reports; Vehicle characteristics; Accident factors; Driver vehicle road interfaces; Accident reconstruction; Accident studies; Crash phase; Precrash phase

HS-011 920 Fld. 1/3; 4/5

MULTI-DISCIPLINARY INVESTIGATIONS TO DETERMINE AUTOMOBILE ACCIDENT CAUSATION. REPORT NO. 2, ACCIDENT CASE ANALYSIS AND DATA PROCESSING PROCEDURES. TECHNICAL REPORT

by J.C. Fell; K.J. Tharp

Cornell Aeronautical Lab., Inc.

1969 164p
Report no. CAL-VJ-2224-V-2

Sponsored by the Automobile Manufacturers Assoc., Inc. under Memorandum Agreement No. FP-10.

This report describes the process employed in analyzing the individual case data collected by the intensive investigations; and the preparation of these data for storage in and retrieval from computer files so that relationships between cases may be explored. The data collected by the multi-disciplinary team investigations of vehicle accidents were used to reconstruct the precrash, crash, and postcrash conditions and dynamics of the accident event. An individual accident report was written and provided a summarization of the observations and data collected, a description of the various stages of the accident, and a listing of the causation factors as concluded by the investigators. The individual case report was then processed for use with CAL's computer equipment. Processing consisted of partial numeric and partial alphanumeric coding of the data obtained and an alphanumeric presentation of the description and causation factors in a semi-structured form.

Search terms: Electronic accident analysis; Accident case reports; Multidisciplinary teams; Accident factors; Accident causes; Accident reconstruction; Precrash phase; Crash phase; Postcrash phase; Coding systems; Data processing; Accidents by vehicle make; Automated accident records; Highway characteristics; Damage severity index; Accident investigation; Man machine systems; Environmental factors; Driver vehicle interface; Human factors; Failures; Driver errors

HS-011 921 Fld. 1/3; 4/5

MULTI-DISCIPLINARY INVESTIGATIONS TO DETERMINE AUTOMOBILE ACCIDENT CAUSATION. REPORT NO. 3, COMPUTER ANALYSIS TECHNIQUES. TECHNICAL REPORT

by J.O. Hedlund; E.F. Mudrowsky; K.J. Tharp

Cornell Aeronautical Lab., Inc.

1969 80p
Report no. CAL-VJ-2224-V-3

Sponsored by the Automobile Manufacturers Assoc., Inc. under Memorandum Agreement No. FP-10.

This report describes those electronic data processing procedures developed for processing and analyzing the mass of accident data. A description of each computer program utilized is presented. The ABSTRACT program produces an abstract of the accident and rearranges the data for efficient retrieval in subsequent analysis. The SEARCH and MODIFIED SEARCH programs were developed to fullfill the need to analyze the accident factors either singularly or in combinations. Included are the more specific details (data preparation, control cards, etc.) dealing with the mechanics of implementing the programs, as well as the organization and location codes of the information in the data matrix.

Search terms: Data processing; Computer programs; Information retrieval; Accident causes; Electronic accident analysis; Digital computers; Multidisciplinary teams; Automated accident records; Accident investigation; Flow charts; Accident case reports; Precrash phase; Accident analysis; Human factors; Environmental factors; Accident factors

HS-011 922 Fld. 1/3

MULTI-DISCIPLINARY INVESTIGATIONS TO DETERMINE AUTOMOBILE ACCIDENT CAUSATION: FINDINGS. TECHNICAL REPORT

by K.J. Tharp; T.G. Calderwood; J.J. Downing; J.C. Fell; J.W. Garrett; E.M. Mudrowsky

Cornell Aeronautical Lab., Inc.

1970 209p
Report no. CAL-VJ-2224-V-4

Sponsored by the Automobile Manufacturers Assoc., Inc. under Memorandum Agreement No. FP-10.

A study of causal factors has resulted in a concept of accidents which defines the highway transportation system in terms of its components and their functions; defines accidents in terms of disruptions in system performance; presents system performance and operation in terms of components, emphasizing the responsibilities of the driver; defines disruptions or failures as resulting from failures of components or inteactions; and provides a means of relating observations and conclusions from individual accident cases to failures within the system. The data collected may be useful in preventing or mitigating the effects of accidents.

Search terms: Accident investigation; Etiology; Accident analysis; Accident causes; Accident factors; Multidisciplinary teams; Accident statistics; Accident location; Time of accidents; Driving tasks; Driving conditions; Decision making; Driver characteristics; Precrash phase; Crash phase; Truck accidents; Vehicle characteristics; Highway characteristics; Driver vehicle road interfaces; Driver experience; Driver errors; Man machine systems; Driver physical fitness; Driver performance; Chi square test; Accidents by vehicle make; Accidents by vehicle age; Driver mental fitness; Environmental factors; Failures

HS-011 923 Fld. 1/3

MULTI-DISCIPLINARY INVESTIGATIONS TO DETERMINE AUTOMOBILE ACCIDENT CAUSATION. REPORT NO. 5, A DESCRIPTIVE ANALYSIS OF INDIVIDUAL TRAFFIC ACCIDENTS. TECHNICAL REPORT

by K. Perchonok

Cornell Aeronautical Lab., Inc.

1969 82p
Report no. CAL-VJ-2224-V-5

Sponsored by the Automobile Manufacturers Assoc., Inc. under Memorandum Agreement No. FP-10.

Before meaningful analysis of a large number of accidents can proceed, organization must be imposed upon the data. To this end a logical analysis was developed and applied to each unit involved in the Cornell Aeronautical Laboratory's sample of intensively investigated accidents. The result was a simple description of the development of each accident and the main reason(s) for each driver's behavior. In addition to specification of the critical event and its reason, the analysis required determination of the sources of information failures and compulsory responses, the location of that source in terms of the subject unit's path, the primary consequence of the critical event, and the location of the unit involved in the primary consequence. The analysis described is designed to produce the required set of comprehensive accident descriptors to allow the study of accident generation.

Search terms: Accident analysis; Accident causes; Statistical analysis; Accident types; Multidisciplinary teams; Accident factors; Driver errors; Buffalo; Pennsylvania; Accident investigation; Precrash phase; Loss of control; Failures; Driver vehicle interface; Crash phase; Man machine systems; Human factors

HS-011 924 Fld. 1/3; 1/5

RESEARCH FOR A LOAD SAFETY CAMPAIGN--ACCIDENT STUDIES FOR ADVERTISING FORMULATION

by A.M. Mackie

Transport and Road Res. Lab. (England)

1972 23p 1ref
Report no. TRRL-LR-432

A study has been carried out to find whether accident record analysis and follow-up interviews with drivers involved in accidents can provide useful information for the design of propaganda dealing with specific driving situations. The driving situations investigated here are turning right and overtaking. Accidents within these two major categories have been further sub-divided on the basis of vehicle movement, so that the propaganda can illustrate in detail the types of accidents which occur most frequently. Follow up interviews with drivers having those types of accidents have been used to establish how the accidents occurred. These interviews have indicated lack of awareness of the presence, and to a lesser extent the movement, of other vehicles. Both physical and psychological reasons have been given by drivers for such errors. This better understanding of drivers' errors should help to make driver training and propaganda more effective.

Search terms: Accident causes; Accident research; Accident analysis; Right turns; Overtaking; Psychological factors; Driver interviews; Accident factors; Accident types; Safety propaganda; Safety campaigns; Driver error caused accidents; Driver characteristics; Accident records

HS-011 925 Fld. 1/3; 1/5; 2/8

OPERATION 101. FINAL REPORT, PHASE 4, PT. 2, RELATIONSHIPS

California Dept. of Hwy. Patrol

1972 81p

Operation 101 was designed to determine the effect of increased traffic law enforcement on accidents and violations. The study was carried out in 1964 on U. S. 101 in San Diego County, California. Significant relationships were

1/3 Investigation (Cont'd.)

HS-011 925 (Cont'd.)

found between hour and day of year and accidents; but none were meaningful due to the small number of accidents in each time period. From the shift analysis, the three enforcement actions–arrests, verbal warnings, and mechanical warnings–and the officer's presence as measured by in-view hours and total stops were significantly related to accidents. The arrest-accident relationship on the midnight shift is distinct from day and swing shift accident-arrest relationships. Arrests and rainfall were significant variables on weekends but not on weekdays. No variable was found to have a consistent relationship during the weekday. Of the total monthly variation, 90.8% was explained for reportable accidents. The regression equation was not significant.

Search terms: Accident rates; Time of accidents; Time of day; Day of week; Day vs night accidents; Rain; Arrests; Traffic law violations; Regression analysis; Accident analysis; Variables; California; Traffic law enforcement; Manpower utilization; Law enforcement effect on accident rates; Police traffic services

HS-011 926 Fld. 1/3; 1/5; 2/8

OPERATION 101. AN ACCIDENT AND ENFORCEMENT STUDY (CONDENSATION)

California Dept. of Hwy. Patrol

1972 17p

Operation 101 was a study designed to determine whether traffic law enforcement is or is not effective in reducing accidents. The study was carried out in 1964 on U. S. 101 in San Diego County, California. Traffic surveillance hours spent on the roadway were doubled. The study revealed that when manpower and enforcement actions increased, driver violations and accidents were reduced. An increase in traffic officer presence alone was not sufficient to reduce accidents. There must be a significant amount of inview patrol and the results–enforcement actions–must be apparent to the motoring public.

Search terms: Accident rates; Traffic law violations; Traffic surveillance; Traffic law enforcement; Accident prevention; Time of accidents; Time of day; Day of week; Day vs night accidents; Rain; Manpower utilization; Arrests; California; Accident location; Police traffic services; Law enforcement effect on accident rates

HS-011 927 Fld. 1/3; 1/5; 2/8

OPERATION 500. A STUDY OF THE EFFECT OF INCREASED ROAD PATROL. FINAL REPORT

California Dept. of Hwy. Patrol

1972 141p

Five hundred traffic officer positions granted by the California Legislature for the reduction of accidents were allocated to roadways felt to be susceptible to accident reduction. A reduction of accidents between January 1966 and February 1968 was achieved. A statistically significant relationship was obtained between manpower and moving violations, moving violations and reportable accidents, and reportable accidents and manpower. More than 2 men per mile per 100,000 vehicle miles of travel are required for nonmetropolitan roadways to effect accident reduction. Fatalities were reduced by 19% and severe injuries by 11.2%.

Search terms: California; Accident statistics; Traffic law violations; Traffic law enforcement; Accident prevention; Manpower utilization; Vehicle mileage; Arrests; Rural highways; Fatality rates; Police traffic services; Injury rates; Day of week; Time of accidents; Time of day; Day vs night accidents; Injury severity; Accident location; Law enforcement effect on accident rates; Accident rates

HS-011 928 Fld. 1/3; 3/4

THE PSYCHOLOGY OF FATAL ACCIDENT

by N. Tabachnick

Published in *Essays in Self-Destruction*, New York, 1967

16p 6refs

A study was conducted by a group of psychoanalysts to investigate the psychological factors involved in fatal or near-fatal accidents. Observations from their study are presented. Interpretation of the data indicates that some serious accidents may be understood as the unplanned side effects of certain patterns of behavior. These are transiently entered when persons with a potentiality for action ways of life encounter anxiety-filled and temporarily overwhelming responsibilities.

Search terms: Psychological factors; Fatalities; Accident causes; Accident proneness; Driver behavior; Stress (psychology); Case reports; Driver personality; Driver performance under stress

1/4 Locations

HS-011 929 Fld. 1/4; 2/4; 4/3

SAFETY IMPROVEMENT PROJECTS: SUMMARY

by C.W. Dale

Federal Hwy. Administration

1971 30p 3refs

The purpose of this brochure is to illustrate the variety and effectiveness of some of the safety improvements that have been implemented under the Spot

Safety Improvement Program. The brochure is in two parts. The first part presents an overall summary of state highway department before-and-after evaluations of 257 safety improvement projects completed since January 1965. The second part contains descriptive data for 13 selected safety improvement projects. Costs and benefits of improvements are described.

Search terms: Accident rates; Spot improvement program; Accident prevention; Hazards; Fatality rates; Injury rates; Benefit cost analysis; Highway improvements; Accident location; Chi square test

HS-011 930 Fld. 1/4; 2/4; 2/6; 3/11

AN ANALYSIS OF FLORIDA'S COMPLIANCE WITH FEDERAL HIGHWAY SAFETY STANDARDS 9, 12, AND 14. VOL. 1

Florida Dept. of Transp.

1971 178p

Prepared for the Florida Legislature.

The purpose of this report is twofold: to evaluate Florida's compliance with the federal highway safety standards dealing with the identification and surveillance of accident locations (Standard 9); highway design, construction, and maintenance (Standard 12); and pedestrian safety (Standard 14); and to make recommendations on actions required to bring Florida into full compliance with the three federal standards. A summary of the findings, a list of recommendations to the Legislature and state agencies involved, and a detailed analysis of state and local compliance on each of the safety standards are included. With but a few exceptions, state agencies are in a high degree of compliance with the federal safety standards. The big gap in Florida's compliance occurs at the local level.

Search terms: Highway safety standards; Safety standards compliance; State action; State government; Local government; Florida; Accident location; Highway design; Highway construction; Pavement skid resistance; Accident surveillance; Highway maintenance; Highway lighting; Highway improvements; Emergency road services; Railroad grade crossings; Pedestrian safety; Child safety; Accident records

1/5 Statistical data

HS-011 931 Fld. 1/5; 1/3

TRAFFIC CRASHES IN BRISBANE. AN ENGINEERING, MEDICAL AND SOCIOLOGICAL STUDY

by K.G. Jamieson; A.W. Duggan; J. Tweddell; L.I. Pope; V.E. Zvirbulis

Australian Road Res. Board

1971 378p 160refs
Report no. SR-2

A multidisciplinary accident investigation, using the case study method, was undertaken. Engineering data given relates to general features of the environment, the vehicles, the people, general accident circumstances, and degree of damage to vehicles. Medical data concern injury of occupants; the vehicle as an injury producing agent; injuries of pedestrians; and motorcycle, scooter, and bicycle accidents. The sociological report concerns driver personality aspects, reckless drivers, drinking drivers, age factors, and young drivers.

Search terms: Multidisciplinary teams; Accident studies; Accident statistics; Accident causes; Injury severity; Injury statistics; Pedestrian injuries; Fatalities; Motor scooter accidents; Motorcycle operator injuries; Brisbane; Driver age; Reckless drivers; Damage severity; Accident investigation; Environmental factors; Age factor in accidents; Drinking drivers; Driver intoxication; Young adult drivers; Time of accidents; Injury causes; Ejection; Driver personality; Psychological factors; Accident responsibility; Sociological factors; Medical factors; Accident factors; Accident types

2/0 HIGHWAY SAFETY

2/4 Design and Construction

HS-011 932 Fld. 2/4; 4/7

OPTIMAL GEOMETRIC DESIGN DECISIONS FOR HIGHWAY SAFETY

by L.E. Haefner; E.K. Morlock

Published in *Highway Research Record* n371 p12-23 (1971)

31refs

Sponsored by Highway Research Board Committee on Operational Effects of Geometrics.

The continuing high accident rate on the highways and associated social and economic cost have made improvement in highway safety one of the high priority objectives of agencies responsible for road investment and management. Our knowledge of factors contributing to highway accidents is not complete, nor is our knowledge of the value of accident reductions. In dealing with these problems, the highway engineer must make decisions with respect to model or models to use or to develop ways to deal with the uncertainty of his predictions and evaluations, and changes to implement. This paper presents a framework that was developed to deal with these and related problems and describes its pilot applicator to a rural spot-improvement problem in the Midwest.

Search terms: Highway safety; Highway design; Highway accident potential; Benefit cost analysis; Mathematical models; Spot improvement program; Decision theory; Accident prevention; Highway improvements; Rural highways; Accident rates; Accident risk forecasting

2/5 Lighting

HS-011 933 Fld. 2/5; 4/3

ECONOMIC AND ACCIDENT POTENTIAL ANALYSIS OF ROADWAY LIGHTING ALTERNATIVES

by W.F. McFarland; N.E. Walton

Published in *Highway Research Record* n377 p92-102 (1971)

5refs

Sponsored by Committee on Visibility and presented at the Highway Research Board 50th annual meeting.

The objective of this study was to investigate cost-effectiveness relationships for various roadway lighting design criteria and roadway geometry. Lighting design criteria (effectiveness), consisting of average illumination, average-to-minimum ratios of illumination, and maximum-to-minimum ratios of illumination, were applied to roadway geometry configurations of four, six, eight, and ten traffic lanes. Five illumination design alternatives were selected and compared on the basis of the design criteria for the various roadway configurations. Cost data included initial, maintenance, operational, and accident costs. Comparisons were made on a cost basis for those designs that gave a particular level of effectiveness for a specific roadway. Tables summarize the cost-effectiveness relationships.

Search terms: Highway lighting; Lighting design; Benefit cost analysis; Vehicle light pole collisions; Accident costs; Injury costs; Breakaway light poles; Accident risk forcasting; Lighting equipment costs; Damage costs; Maintenance costs

2/9 Traffic Control

HS-011 934 Fld. 2/9

THE VISUAL ENVIRONMENT: ITS EFFECTS ON TRAFFIC FLOW

by W.L. Smith; J.E. Faulconer

Published in *Highway Research Record* n377 p131-48 (1971)

8refs

Sponsored by Highway Research Board Committee on Visibility.

This study explored the relationship between urban arterial traffic flow and the arterials' visual surrounding. Kansas City, Mo. was selected as the study site. The visual input into the driver-vehicle system was defined by three generalized categories: color contrasts of possible focal points, dynamics of possible focal points, and naturalness of focal areas. The effects that variance in these three categories of visual input had on the breakdown of the operational output of the driver-vehicle system was categorized by the number of accidents and the amount of interference to travel apparent along the study segments. Results showed that the masses of traffic signs, commercial signs, contrasting colors, and other visual displays found on many arterial streets have the pronounced effect of increasing the magnitude of congestion and the number of accidents.

Search terms: Urban traffic flow; Arterial streets; Kansas City (Mo.); Arterial traffic volume; Traffic congestion; Traffic signs; Accident causes; Visual perception; Color perception; Traffic impedances; Advertising signs

HS-011 935 Fld. 2/9

LIGHTED DEER CROSSING SIGNS AND VEHICULAR SPEED

by T.M. Pojar; T.C. Reseigh; D.F. Reed

Colorado Div. of Game, Fish and Parks; Colorado Dept. of Highways

1971 10p 1ref
Report no. PB-207 218

Prepared in cooperation with the Federal Hwy. Administration.

Two types of lighted deer crossing signs were evaluated to determine their effect on the speed of traffic. A speed recording station was located 800 feet behind the deer crossing sign. The average speed of vehicles past the recording station, with neither sign turned toward traffic nor activated, was 54.52 mph; with the lighted deer crossing sign turned toward traffic, the average speed dropped to 53.03 mph; and with the lighted animated sign turned toward traffic the average speed was 51.59 mph. For the 28-day treatment period, there was no significant relationship between the number of days the sign was on and the speed of traffic.

Search terms: Deer crossing signs; Sign effectiveness; Sign design; Speed patterns; Colorado; Sign lighting; Animated signs

AVAILABILITY: NTIS

HS-011 936 Fld. 2/9

ANNUAL SPEED STUDY

Arizona Hwy. Dept.

1971 81p

In cooperation with the Federal Hwy. Administration.

A study was conducted to determine speed distribution and speed trends by vehicle type on the Arizona state highway system. The speed samples were obtained using a radar speed meter and an unmarked vehicle at 25 permanent stations throughout the state. All sample vehicles were recorded under conditions which, theoretically, would enable each driver to choose a speed without influences of geometric design, signing, vehicular congestion, inclement weather, or unsafe conditions. The resultant data were utilized to produce the various graphs, tables, and speed distribution curves shown in this report. Comparison of the composite speed trends with those in the 1970 study indicates that operating speeds have increased at most stations. The increase in composite speed trends this year may not necessarily be an indication of increased operating speeds, but may be an indication of increased anonymity of the radar vehicle used in this study.

Search terms: Speed studies; Speed patterns; Day vs night speeds; Speed limits; Secondary roads; Primary highways; Rural highways; Urban highways; Arizona; Speed differential; Highway characteristics

HS-011 937 Fld. 2/9; 1/3

SYSTEMS FOR RESPONDING TO FREEWAY ACCIDENTS; AN ANNOTATED BIBLIOGRAPHY

by C. Lu; G. Agarwal

California Univ., Berkeley

1971 67p 196refs
Report no. HRB-Bib-53

Emphasis is given to the following areas: systems that are under operation or experimentation or feasible for detecting and locating highway accidents; systems for providing to highway users after an accident has been detected and located the desirable high level of service, which includes providing medical aid to the victim, restoring normal traffic flow, alarming affected drivers about the disturbance, and if necessary advising them of alternate routes; mathematical treatment of traffic flow theories that attempt to relate the accident characteristics to traffic parameters and their influence on traffic characteristics, e.g., delay and congestion; safety aspects to motorists such as highway safety program, safety standard, and treatment of secondary accidents; system economics; and advanced techniques in system planning, design, analysis, and evaluation.

Search terms: Bibliographies; Freeways; Emergency services; Traffic flow; Emergency traffic control; Police traffic services; Highway safety standards; Highway safety programs; Accident location; Mathematical models

AVAILABILITY: HRB $2.40

HS-011 938 Fld. 2/9; 4/7

THE SIMULATION OF SOME SIMPLE CONTROL POLICIES FOR A SIGNALIZED INTERSECTION

by D.H. Green; M.G. Hartley

Published in *Operational Research Quarterly* v17 n3 p263-77

10refs

The authors present the results of some simulation studies concerned with the computer control of signalized intersections. The simplest model considered is that of two competing random streams. The transient response and delay/flow characteristics of some simple control procedures are investigated. These are based on the Dunne-Potts policy in which the traffic light is switched when the queue of the road with right of way has been dispersed. The model is then developed to consider four competing streams and the control policies are modified accordingly. Similar results to the two-stream case are presented. In the final section turning vehicles are considered by including eight competing streams in the intersection model.

Search terms: Signalized intersections; Traffic actuated signals; Computer controlled signals; Computerized simulation; Queueing models; Traffic simulation; Traffic models; Traffic signal timing; Traffic flow; Turning

2/11 Traffic Records

HS-011 939 Fld. 2/11; 3/6; 4/5

TRAFFIC RECORDS: KEY TO HIGHWAY SAFETY

by R.D. Lipps

Published in *Highway User* p16-9 (Mar 1972)

Information obtained from traffic reports is an essential tool for the government agencies which must develop plans for accident prevention. All highway safety programs must be based on facts if they are to be effective. The necessary data include facts on drivers, highways, and vehicles, as well as on accidents. Modern traffic records systems collect and store the facts and produce them in usable form when they are needed by the researcher.

Search terms: Traffic records; Computerized records management; Computerized driver records; Accident records; Accident prevention; Inspection records; Accident location; Traffic law enforcement; State motor vehicle departments; Automated accident records

3/0 HUMAN FACTORS

3/2 Anthropomorphic Data

HS-011 940 Fld. 3/2; 4/7

THEORETICAL MECHANICS FOR EXPRESSING IMPACT ACCELERATIVE RESPONSE OF HUMAN BEINGS

by D.J. Thomas; C.L. Ewing

Naval Aerospace Medical Res. Lab.

Published in *AGARD Conferenc Proceedings n88* (AGARD-CP-88-7 1971 p12-(1-7)

10refs

Presented at the Aerospace Medi Panel Specialist Meeting, AGAR Conference on Linear Acceleration o. Impact Type, Oporto, Portugal, 23-26 Jun 1971.

Two basic coordinate systems necessary for expression of the kinematics of

3/2 Anthropomorphic Data (Cont'd.)

HS-011 940 (Cont'd.)

human impacts are identified as: the body reference frame, defined in terms of the experimental subject's anatomy; and the laboratory reference frame, selected by the experimenter as required for each experiment. A general set of rules for deriving these coordinate systems is described. Necessary variables and parameters are defined in terms of the general set of rules.

> Search terms: Human body kinematics; Acceleration response; Crash response forecasting; Angular acceleration; Angular velocity; Displacement; Biomechanics; Mathematical models

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3/3 Cyclists

HS-011 941 Fld. 3/3; 1/2

THE BIOMECHANICAL ASPECTS OF CRASH HELMET DESIGN

by J.H. McElhaney; V.L. Roberts; R.L. Stalnaker

Michigan Univ. Hwy. Safety Res. Inst.

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 pD2-(1-8)

18refs

> Presented at the Aerospace Medical Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

A head injury model capable of predicting head injury through a maximum strain criteria has been developed. This model is coupled to a helmet model, and the combination allows the prediction of optimum helmet performance characteristics within a given set of constraints including size and weight. Several model exercises consisting of varying coupling parameters are presented. It is concluded that helmet performance is improved by decreasing elastic stiffness and increasing damping properties. However, in applying these results, care must be taken to avoid bottoming of the suspension or liner.

> Search terms: Helmet design; Head injuries; Injury prediction; Mathematical models; Head impact tolerances; Animal impact tolerances; Injury research; Biomechanics; Monkeys; Impact angle; Performance characteristics

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HS-011 942 Fld. 3/3

EVALUATION AND TESTING OF PROTECTIVE HEADGEAR.

by G.G. Snively

Snell Memorial Foundation, Inc.

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 pD4-(1-7)

Grant EC-00013

> Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

Review is made of factors which must be considered in evaluating the performance of protective headgear. Standards of performance are considered, and an analysis is presented of a number of the techniques utilized in helmet testing. Special attention is given to tests for penetration resistance, retention harness strength, and protection against impact.

> Search terms: Head protection; Helmet design; Penetration tests; Helmet harnesses; Helmet impact tests; Helmet standards; Temperature endurance tests

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3/4 Driver Behavior

HS-011 943 Fld. 3/4; 4/8

THE ATTITUDES OF DRIVERS TOWARD MASS-TRANSIT

by F.J. Beier

Minnesota Univ.

1971 25p 4refs
Contract DOT-UT-257
Report no. UMTA-URT-36(70)-71-1; PB-207 131

This report is a study of the attitudes of drivers toward mass transit in the Minneapolis-St. Paul metropolitan area. Perhaps the most comprehensive of the studies was a personal interview survey of approximately 600 residents of the Twin Cities area. Also a five-county area was sampled by mail questionnaire. The survey had three primary objectives: to identify the basic motivations for driving; to examine the effectiveness of using negative factors as a means of inducing drivers to use public transportation; and to determine what positive factors could be used to attract ridership. It was concluded that people used their automobiles because they perceive greater flexibility and convenience as compared to public transportation. If mass transit can provide the same flexibility and convenience as the automobile, the driving public may be willing to switch.

> Search terms: Minneapolis; Saint Paul; Public transportation usage; Driver attitudes; Driver motivation; Questionnaires; Interviews; Urban areas; Rural areas; Suburban areas; Consumer acceptance; Automobile usage; Minnesota

AVAILABILITY: NTIS

3/5 Driver Education

HS-011 944 Fld. 3/5; 2/7

ONE GOOD SKID PREVENTS ANOTHER

by R.B. Overend

Published in *Traffic Safety* v72 n4 p22-5, 36-8 (Apr 1972)

The author describes the experience and knowledge he gained when he attended the National Safety Council's sixth annual Winter and Emergency Driving Workshop for driver education instructors. The purpose was to learn how to avoid skidding on glare ice and how to counteract skidding when it actually occurred. The instruction was performed in automobiles operating on an ice field. The three kinds of skids, braking skids, power skids and turning skids, and how to maneuver to counteract them were demonstrated under actual conditions.

Search terms: Skidding; Icy road conditions; Skid control; Braking; Behind the wheel instruction; Critical velocity; Driver emergency responses; Winter driving; Instructor training; Steering

HS-011 945 Fld. 3/5

TRANSFER EFFECTIVENESS OF SIMULATION IN A DRIVER EDUCATION PROGRAM

by M.L. Baron; R.C. Williges

Illinois Univ. Hwy. Traf. Safety Center

1971 53p 13refs
Report no. RR-5

This study investigated the effects of different amounts of film and simulator instruction on driving knowledge and behind-the-wheel driving performance. There was no effect of such instruction on improvement in driving knowledge. Film-only and simulator instruction pretraining produced equivalent effects in terms of driving performance. Six hours of pretraining yielded significantly better driving performance than either three hours of pretraining or a control group receiving no pretraining. The effect of previous experience upon simulator performance was examined by comparing the simulator performance of licensed drivers with that of simulator students. Licensed drivers exhibited superior performance to the students early in simulation on steering response, but the students were superior to the licensed drivers late in simulation. Analysis of the effect of type of pretraining on the components of driving performance during the first behind-the-wheel testing session revealed the film-only groups to be superior to the simulator groups on procedures.

Search terms: Driving simulators; Behind the wheel instruction; Motion picture effectiveness; Driver experience; Driver tests; Variance analysis; Driver performance; Driver education evaluation; Factor analysis; High school drivers; Driver errors; Learning rates

3/6 Driver Licensing

HS-011 946 Fld. 3/6; 3/5

THE MASTER DRIVER PLAN

by B. Brown

Published in *Car and Driver* v17 n10 p32-5, 37-8 (Apr 1972)

The possibility of a Master Driver License is discussed. Such a plan acknowledges that some drivers, properly trained, can be expected to avoid accidents and should be rewarded for their expertise by granting them a Master Driver's License. This license possibly could entitle its holder to lower insurance premiums; lower toll rates; higher speed-limits on specifically posted roadways; and the right to buy high performance vehicles without insurance penalties being imposed.

Search terms: Driver license standards; Classified driver licenses; Driver education; Questionnaires; Driver skills; Accident free drivers

4/0 OTHER SAFETY-RELATED AREAS

4/1 Codes and Laws

HS-011 947 Fld. 4/1; 5/6

CUMULATIVE REGULATORY EFFECTS ON THE COST OF AUTOMOTIVE TRANSPORTATION (RECAT). FINAL REPORT OF THE AD HOC COMMITTEE

Ad Hoc Com. on the Cumulative Regulatory Effects on the Cost of Automotive Transp.

1972 336p refs

Prepared for the Office of Science and Technology.

The RECAT Committee has considered existing laws and regulations which will affect automotive transportation in the U. S. The Committee's study was largely limited to those federal rules and regulations which are concerned with: emission control; safety; damage limiting design; highway design; and noise reduction. This report attempts to outline the known and anticipated effects of these regulations.

Search terms: Air pollution emission factors; Exhaust emission control devices; Air quality standards; Highway improvements; Vehicle air pollution; Noise control costs; Benefit cost analysis; Clean Air Act of 1970; Vehicle safety standards; Safety standards costs; Restraint systems; Safety device costs; Air pollution sources; Drinking drivers; Air pollution control costs; Interstate Highway System; Vehicle noise; Federal control; Regulations

AVAILABILITY: GPO $3.00

4/2 Community Supports

HS-011 948 Fld. 4/2; 4/3

A RECONNAISSANCE OF PUBLIC EDUCATION PROGRAMS FOR TRAFFIC SAFETY

Little (Arthur D.), Inc.

1967 70p 6refs
Report no. C-68564

Sponsored by California Traffic Safety Foundation.

Attention was given to three factors: the state-of-the-art of public education programs in traffic safety; expenditures on traffic safety and sources of additional financing for expanded programs; and ways and means of organizing the programs of public education in traffic safety. Recommendations include: studies to measure effectiveness of public education in traffic safety; business firms in California should explore the economic feasibility of reducing accident costs through new programs for educating employees to be better drivers; the California Traffic Safety Foundation must expand its activities, undertake a program of broadening its membership support, and seek federal funds to supplement its financial resources; an additional tax should be earmarked for public education programs in traffic safety.

Search terms: Safety program effectiveness; California; Public information programs; Highway safety programs; Highway safety standards; State of the art studies; Financing; Safety education; Benefit cost analysis

4/5 Information Technology

HS-011 949 Fld. 4/5

USER'S VIEW OF PROCESS CONTROL COMPUTER SYSTEMS MANAGEMENT

by R.R. Perryman; N.E. Prochaska

Ford Motor Co.

1972 8p
Report no. SAE-720457

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

A survey of industrial control computer applications presently operational in Ford's facilities revealed an approximate 50/50 division between those that were internally and externally implemented. Problems encountered in the planning, launching, and follow-up phase of system installation were found to be common to both internal and external system implementations and are categorized and evaluated as being inherent and environmental in nature. In an effort to avoid anticipated problems characteristic of a computerized installation, proper staffing as an inhouse project team is essential. During the process of developing inhouse talent, three plateaus of system implementation maturity are attained. These plateaus range from complete dependency upon outside assistance to inhouse implementation. Flow charts are developed to depict typical decision paths leading to a plateau of system implementation most appropriate for the particular user turnkey dilemma.

Search terms: Systems engineering; Computers; Flow charts; Production control; Systems analysis

AVAILABILITY: SAE

4/7 Mathematical Sciences

HS-011 950 Fld. 4/7; 2/4

ANALYTICAL AID FOR EVALUATING HIGHWAY AND ROADSIDE GEOMETRICS

by R.R. McHenry; N.J. DeLeys; J.P. Eicher

Published in *Highway Research Record* n371 p36-46 (1971)

13refs

Sponsored by Highway Research Board Committee on Operational Effects of Geometrics.

A mathematical model is described that represents the dynamic motions of a motor vehicle in contact with a variety of roadway and roadside geometric design features including fixed obstacles. The model has 15 degrees of freedom, and all major nonlinearities are included in the motion equations that have been programmed for time-history solutions on a digital computer. The task of interpreting the extensive output information from the model is eased by a computer-graphics display technique that produces detailed perspective drawings of the vehicle and terrain at selected intervals of time during a simulated maneuver. Sample comparisons are presented of analytically predicted vehicle responses and full-scale test results. A description of the validation approach followed in this research effort is included. A series of sample applications is described, and the capabilities of the model to aid in the establishment of improved design specifications for highway and roadside safety are emphasized.

Search terms: Vehicle dynamics; Highway design; Mathematical models; Topographical factors; Vehicle stability; Road profiles; Geometric forms; Computerized simulation; Road shoulders; Railroad grade crossings; Roadside hazards; Single vehicle accidents; Highway accident potential; Vehicle road interface; Accident simulation; Degrees of freedom; Barrier collision tests; Accident research

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-011 951 Fld. 5/1

DEVICE FOR APPLYING BRAKE PEDAL AT A CONTROLLED RATE FOR IMPACT BRAKE TESTING

by C.E. Schaefer; D.P. Derrick

General Motors Corp.

1972 7p 1ref
Report no. SAE-720448

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

The determination of the impact load capability of vehicle brake system components is necessary to verify product design requirements. Testing methods and procedures must minimize the variables inherent in vehicle spike stop applications to assure the acquisition of accurate, meaningful test data. This paper describes the design, development, and characteristics of a device currently in use for spike stop brake applications at a vehicle test facility.

Search terms: Brake pedals; Brake tests; Brake system design; Impact tests; Brake performance; Steadv state; Unsteady state; Time factors

AVAILABILITY: SAE

HS-011 952 Fld. 5/1

EFFECTS OF SURFACE ROUGHNESS OF BRAKE DRUMS ON COEFFICIENT OF FRICTION AND LINING WEAR

by S.K. Rhee; P.A. Thesier

Bendix Corp.

1972 9p 10refs
Report no. SAE-720449

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

The effects of surface roughness of brake drums on coefficient of friction (brake torque) and lining wear were investigated using typical commercial grey cast iron drums and typical commercial linings. Sample and inertia dynamometers were used. The surface roughness is found to significantly affect the coefficient of friction (brake torque) and lining wear, though the effect is dependent upon the lining compositions. The significance and implications of these findings are discussed.

Search terms: Brake drum properties; Coefficient of friction; Brake lining wear; Surface roughness; Brake torque; Dynamometers; Brake lining tests; Brake tests

AVAILABILITY: SAE

HS-011 953 Fld. 5/1; 4/7

AN INVESTIGATION OF THERMAL CONDITIONS LEADING TO SURFACE RUPTURE OF CAST IRON ROTORS

by R. Limpert

Michigan Univ. Hwy. Safety Res. Inst.

1972 15p 7refs
Report no. SAE-720447

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

This paper presents the results of an investigation into the thermal performance characteristics of solid rotor disc brakes. Using the results of mathematical and computer analyses, as well as road test experiments, relationships for predicting the temperature and thermal stress response of the rotor are developed for braking in a single stop. Special emphasis is given to determining the onset of surface cracking as a result of different braking conditions. A design criterion for avoidance of surface rupture in a single stop is developed. Results obtained in the analytical and experimental study indicate that acceptable correlation between temperature prediction and measurement require an exact assessment of the distribution of braking energy between tire and brake and rotor and pad. Thermally induced surface rupture was found to occur when the theoretical compressive surface stress exceeded the yield strength of the material. Inspection of the rotor surface under the microscope showed that single brake applications from a speed of 60 mph produced surface rupture, caused mainly by the temperature gradient existing at the surface of the rotor. For higher rotor temperatures attained over longer periods of time during repeated braking, other factors such as fatigue properties and composition changes have significant effect upon rotor surface deterioration.

Search terms: Disc brakes; Brake discs; Brake temperature; Mathematical analysis; Cracking; Braking forces; Braking time; Thermal stresses; Heat transfer; Cast iron; Brake disc materials; Brake tests; Braking; Fatigue (materials)

AVAILABILITY: SAE

HS-011 954 Fld. 5/1; 5/22

A PROCEDURE FOR EVALUATING BRAKING PERFORMANCE

by R.W. Murphy; F.A. DiLorenzo

Published in *HIT Lab Reports* v2 n10 p7-12 (Jun 1972)

6refs

Sponsored by Dept. of Transp.

Actual stopping distances achieved by the vehicle are compared to ideal stopping distances theoretically achievable if the vehicle brake system were able to modulate the brakes, such that the tires produced peak-braking forces throughout the stop. Test procedures are described for both vehicle and tire tests, and the method employed for calculating ideal stopping distance is given. Results are presented which demonstrate that the method is viable and realistic. A means of comparing tire peak force capability on a given surface to that produced by a standard tire is also discussed.

5/1 Brake Systems (Cont'd.)

HS-011 954 (Cont'd.)

Search terms: Stopping distance; Brake performance; Tire tests; Brake tests; Wet road conditions; Dry road conditions; Coefficient of friction; Antilocking devices; Tire brake force; Tire pavement interface; Mathematical analysis

5/4 Design

HS-011 955 Fld. 5/4

RADIOISOTOPE REVEALS BEHAVIOR OF LUBRICANTS IN TWO-STROKE CYCLE ENGINES

by T. Kohayakawa; Y. Hirai; T. Ogawa; E. Suzuki

Daihatsu Kogyo Co. Ltd. (Japan)

1972 10p
Report no. SAE-720450

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

Three different lubrication systems were studied utilizing radioisotopes: premixed fuel and oil; manifold supply system for the oil; and crankcase supply system for the oil. The lubricating oil was tagged with tritium. The lubricating oil behavior in the crankcase scavenged two-stroke engine has been investigated within the limited operating condition of these tests. The tests show that almost all supplied oil was exhausted within one hour, and the remainder was exhausted gradually. With the premixed supply system, the oil supplied to the engine is exhausted through the exhaust system more rapidly than when the separate lubrication supply system is used. Thus, in the separate supply systems—the manifold supply and crankcase supply systems—the amount of oil remaining in the engine is greater and the residence time longer than that of the premixed supply system for the same engine operating conditions. Consequently, superior lubrication characteristics can be expected with the separate lubrication systems for crankcase scavenged two-stroke cycle engines.

Search terms: Two stroke cycle engines; Lubricants; Radioisotopes; Tritium; Lubricating oil tests; Lubrication systems; Crankcases; Manifolds; Exhaust gases; Engine operating conditions; Scavenging

AVAILABILITY: SAE

HS-011 956 Fld. 5/4

SOLID LUBRICANTS. A SURVEY

by M.E. Campbell

Midwest Res. Inst.

1972 139p 157refs
Contract NASw-1998
Report no. NASA-SP-5059(01)

Major NASA research and NASA-sponsored research in solid-film lubricants are reviewed and various aspects of solid lubrication are discussed including: lubricating solids, bonded lubricants, new developments, methods of evaluation, environmental effects, application methods, novel materials, and designs for the use of solid lubricants. The appendices deal with solid-lubricant specifications and contact stresses imposed on specimens in three types of test machines.

Search terms: Solid lubricants; Solid lubricant powders; Resin binders; Physical properties; Environmental factors; Wear tests; Bonding; Friction tests; Stress analysis

AVAILABILITY: GPO $0.75

HS-011 957 Fld. 5/4

TUBE, PIPE, HOSE, AND LUBRICATION FITTINGS

Society of Automotive Engineers, Inc.

1971 103p
Report no. SAE-HS-150

SAE standards and recommended practices for tubing and fittings are presented. Included are types of tube fittings for various purposes; "O" rings, hose, and hose fittings; hydraulic hose and hose assemblies tests and procedures; connections for various types of tubes, pipe, and hose; materials and types of treatment for tubing; fittings for various types of pipe; drain plugs; lubrication fittings; construction and industrial machinery pipe plugs, size and type of head; and hose clamps.

Search terms: Standards; Fittings; Hoses; Connectors; Tubes; Hydraulic equipment; Metals; Clamps; Plugs

AVAILABILITY: SAE

HS-011 958 Fld. 5/4

WOULD YOU BUY THIS CAR. . .USED?

by P. Bedard

Published in *Car and Driver* v18 n1 p44-7, 96, 98 (Jul 1972)

Experimental safety vehicles (ESVs), intended to demonstrate the technical feasibility of new methods of crash survival, are discussed. NHTSA's philosophy in developing such cars is discussed, and problems met to date are presented. The latter include technical difficulties, the weight of such vehicles, the cost of production, and the lack of economy in maintenance. The approaches of Fairchild and AMF, government contractors to develop and build ESV prototypes, are outlined.

Search terms: Experimental automobiles; Safety cars; National Highway Traffic Safety Administration; Barrier collision tests; Crashworthiness

HS-011 959 Fld. 5/4

IRON AND STEEL

Society of Automotive Engineers, Inc.

1972 177p refs
Report no. SAE-HS-30

SAE standards, recommended practices, and information reports cover: chemical compositions; general data on steels; methods of testing steels; steel fasteners; spring wire and springs; ferrous castings; tool and die steels; ferrous materials; and general data on ferrous and nonferrous materials.

> Search terms: Steels; Iron; Carbon steels; Stainless steels; Standards; Fasteners; Springs; Castings; Materials tests; Mechanical properties; Chemical properties; Steel wire; Physical properties; Heat treatment

AVAILABILITY: SAE

HS-011 960 Fld. 5/4

AN ELECTRO HYDRAULIC SYSTEM FOR SIMULATIONS OF COLLISIONS

by W. Lange

Max-Planck-Inst. fur Arbeitsphysiologie (West Germany)

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 pB3-(1-4)

> Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

This paper briefly describes equipment used in simulations of automobile collisions. The device consists mainly of a guided sled on which the cabin can be mounted forward, obliquely, laterally, or backward. The sled can be accelerated between 0 and 30 g with a piston, powered and controlled by an electro hydraulic catapult. Mechanical, hydraulic, and electrical design features as well as the recording system are described.

> Search terms: Impact sleds; Hydraulic equipment; Catapults; Test equipment; Impact tests; Electric systems; Accident simulation; Impact angle

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HS-011 961 Fld. 5/4

FIAT CATAPULTS

by E. Franchini

Fiat Auto-Avio Res. Labs.

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 pB4-(1-8)

2refs

> Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

Several propulsion systems adopted in the Fiat Auto-Avio Laboratories to launch a car against an obstacle are outlined. The catapult system has been preferred because it allows the launching of a car indoors; it is simple and economical, and it has a high operational flexibility. The low and medium speed impact catapult and the new catapult for collisions at up to 80 km/h of cars up to 2000 kg weight are described. The main types of tests which can be performed on the catapult include: head-on collision against barrier; head-on collision against upright pole; impact against the side of a stationary car; rear end collision; wedging under truck; side impact against barrier; impact against pedestrian; body block against steering wheel; body shell braked abruptly, with dummy inside.

> Search terms: Impact tests; Test equipment; Catapults; Impact velocity; Accident simulation; Impact sleds

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HS-011 962 Fld. 5/4

THE MIRA VEHICLE IMPACT TEST FACILITY

by T.R. Aston

Motor Industry Res. Assoc. (England)

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 pB5-(1-8)

> Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

The indoor test rig built at the Motor Industry Research Association (MIRA) is described. On this test rig a linear induction motor is used as the prime mover and it is capable of accelerating vehicles of up to 10,000 lb. in weight to any speed up to 30 mph. Special provision has been made for high speed cine photography and electronic instrumentation and the entire test rig is automatically controlled. In order to safeguard personnel a comprehensive safety interlock system has been incorporated.

> Search terms: Impact tests; Test facilities; Impact sleds; Linear induction motors; Test equipment; Cinematography; Electronic monitoring systems; Impact velocity

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HS-011 963 Fld. 5/4

A FIXED-HEAD CONCEPT SEL ENGINE

by J.M. Smith

Published in *Institution of Mecha Engineers Proceedings* v186 n16 p193-204 (1972)

> Prepared for presentation at Insti tion of Mechanical Engineers, Lond 6 Apr 1972.

This paper discusses the design an development of a high-speed automoti

5/4 Design (Cont'd.)

HS-011 963 (Cont'd.)

diesel engine incorporating cylinder head and block construction to eliminate high-pressure gas seals and improve cylinder and head cooling. Elimination of the cylinder high-pressure joint was a radical departure from current practice and promised considerable advantages in cooling, reducing thermal stress and freeing restrictions in cylinder-head porting layout. Thus the potential for operating at the highest rating now in use and for future development was improved. For automotive work, using mechanical transmissions, the drooping characteristic of the normal turbocharged engine's torque curve at low speed is a serious disadvantage. Measures taken to overcome this are described.

Search terms: Diesel engines; Diesel engine exhaust emissions; Cylinder heads; Engine blocks; Cooling systems; Camshafts; Turbochargers; Crankcases; Pistons; Valves; Lubrication; Engine design; Engine performance; Ports (openings); Engine speeds

HS-011 964 Fld. 5/4; 5/6

THE GM WANKEL

by R. Eshelman

Published in *Road Test* v8 n6 p28-32 (Jun 1972)

There are two major obstacles to a high volume build rate for a GM Wankel. The first is huge, complex, and costly automatic machine tools. Another is that bringing the Wankel into line, emissionwise, could substantially alter the engine's design. This could influence specifications of major machine tools ordered to build it. In quest of a Wankel engine which will meet Federal emission rules, GM engineers' are exploring every possibility. Those which show promise include exhaust gas recirculation which lowers combustion temperature and in doing so cuts the amount of nitrogen oxides produced. Electronically controlled fuel injection is also a help in lowering emissions. Air injection may be a standard emission-lowering feature. Of all modifications to get Wankel emissions down, the catalytic converter looks the most promising.

Search terms: Wankel engines; Rotary engines; Exhaust emission control; Exhaust gas recirculation; Air injection; Catalytic converters; Seals; Electronic fuel injection; Engine design

HS-011 965 Fld. 5/4; 5/14

A LOOK AT THE SAFETY DREAM CARS

by R.B. Overend

Published in *Traffic Safety* v72 n7 p8-13 (Jul 1972)

American and foreign experimental safety vehicles (ESVs) currently being developed are briefly described. The ESVs discussed include those built by several foreign manufacturers as well as the four domestic ESV manufacturers. Safety features of each ESV are noted.

Search terms: Safety cars; Automobile safety characteristics; Safety design; Automobile design; Foreign automobiles; Experimental automobiles

HS-011 966 Fld. 5/4; 5/14

THE "SAFE" CAR PROBLEM

by W.L. Roper

Published in *California Highway Patrolman* v36 n5 p10-11, 56-7, 59-61 (Jul 1972)

On April 18, 1972, the Fairchild-Hiller experimental safety vehicle was crash tested into a steel barrier at 50 mph. The results of this test are briefly reviewed. While the test vehicle emerged with barely a scratch, the dummy occupants were theoretically killed by the impact because the three air bags designed to protect them failed to inflate as expected. The effectiveness of seat belts and air bag retraint systems are discussed. Other aspects of the auto safety problem include methods of keeping the drunk driver off the highway and vehicle inspection programs.

Search terms: Safety cars; Barrier collision tests; Experimental automobiles; Air bag restraint systems; Automobile safety characteristics; Seat belt effectiveness; Restraint system failures; Restraint system effectiveness; Drinking drivers; Recall campaigns; Restraint system usage; Vehicle inspection; Defective vehicles; Inspection costs

HS-011 967 Fld. 5/4; 5/17

SAFER CARS ARE ON THE WAY

by W.L. Roper

Published in *California Highway Patrolman* v36 n1 p4-5, 22-3, 26-7, 29-30, 36-7 (Apr 1972)

Designed in accordance with the government's experimental standards, four experimental safety vehicles (ESV's) embodying new ideas in safety design are being constructed by AMF, Inc., Fairchild Industries, Inc., General Motors Co., and Ford Motor Co. While these experimental models will never become mass-production cars, many of their safety features will be used in the new mass-production cars, which will be on the market probably in 1973 and 1974. Among the safety factors to be expected in the new cars are: Improved shock-absorbing bumpers; brighter headlights, but designed to cause less glare; special roll bars; better interior padding. Recall campaigns since 1966 are also discussed.

Search terms: Automobile design; Safety cars; Bumper design; Automobile safety characteristics; Safety design; Automobile recall campaigns; Defective vehicles; Federal control; Experimental automobiles; Crashworthiness; Energy absorbing bumpers

5/6 Fuel Systems

HS-011 968 Fld. 5/6

7 NEW WEAPONS FOR DETROIT TO FIGHT EXHAUST EMISSION

by A. Perrow

Published in *Motor* (New York) v137 n4 p40-4 (Apr 1972)

Exhaust gas recirculation, electronic ignition, thermal reactors, stratified charge engines, low-lead gasoline, catalytic converters, and exhaust emission testers are described and explained in regard to their design and function and how they will affect the automotive service industry.

Search terms: Exhaust emission control devices; Exhaust emission standards; Exhaust gas recirculation; Exhaust emission control device maintenance; Electronic ignition systems; Thermal reactors; Stratified charge engines; Low lead gasoline; Catalytic converters; Exhaust emissions measurement; Carbon monoxide; Nitrogen oxides; Hydrocarbons; Dual bed catalyst systems

HS-011 969 Fld. 5/6

EFFECTS OF GASOLINE ADDITIVES ON CARBURETOR AND PCV SYSTEM PERFORMANCE AS THEY RELATE TO EXHAUST EMISSIONS. FINAL REPORT

by M. Smith; L.A. McAdams

Scott Res. Labs., Inc.

1972 221p
Report no. CRC-APRAC-CAPE-2-68-2; SRL-2873-05-0172; PB-210 268

Prepared for the Coordinating Res. Council, Inc. and the Environmental Protection Agency.

Three groups of 16 cars each were operated on the same base fuel, with two of the fuels modified with CRC-provided additives. Exhaust emission, PCV valve flow, and idle rpm (for a total of 19 dependent variables) were measured when the vehicles started the test and at each subsequent 4,000 mile interval through 12,000 miles. End-of-test measurements were made on a subset of vehicles driven more than 12,000 miles. Each of 16 dependent variables was regressed on mileage in order to utilize fully the results obtained on those vehicles driven more than 12,000 miles. Analysis of the data shows that vehicles operated on fuels containing the gasoline additives had lower carbon monoxide emissions than those operated on the nonadditive fuel. The lower carbon monoxide emissions were accompanied by increases in carbon dioxide. The higher CO emissions for vehicles operated on the nonadditive fuel were probably caused by carburetor throttle body deposits.

Search terms: Exhaust emission tests; Carburetor deposits; Variance analysis; Regression analysis; Carbon monoxide; Hydrocarbons; Positive crankcase ventilation valves; Carbon dioxide; Fuel additives; Exhaust emissions measurement; Knock; Automobile comparisons; Vehicle mileage; Variables; Idling; Tuneup; Engine operating conditions; Throttle body deposits; Engine performance; Steady state

AVAILABILITY: NTIS $6.75

5/9 Inspection

HS-011 970 Fld. 5/9

PERIODIC MOTOR VEHICLE INSPECTION IN NORTH CAROLINA; A FOLLOW-UP STUDY

by D.W. Reinfurt; E.G. House; D.N. Levine

North Carolina Univ. Hwy. Safety Res. Center

1971 59p 3refs

Partially supported by the North Carolina Governor's Highway Safety Program and the Insurance Inst. for Highway Safety.

This study examines differences in various car models with respect to failure rates for selected inspection items. Inspection receipts of a special sample of 76,668 privately-owned passenger cars inspected in December 1968 were collected to provide statistics for comparison with those in the 1966 sample. Not only has the overall failure rate decreased from 70.1% in the 1966 sample to 33.8% in the 1968 sample, but the average repair charge (per vehicle with repair charge assessed) is generally lower for this sample than for the previous sample. Both samples indicate a positive association of both vehicle age and mileage with the percentage of vehicles failing inspection. Headlights and license plate lights have the highest rate of failure. Failure rates are given for various components and various car models.

Search terms: North Carolina; Vehicle inspection; Failures; Repair costs; Vehicle age; Vehicle mileage; License plate lamps; Headlamp failures; Parking lamps; Stop lamps; Taillamps; Brake failures; Turn signal failures; Windshield wiper failures; Horns; Steering system failures; Emergency brakes; Automobile models; Lamp failures

5/10 Lighting Systems

HS-011 971 Fld. 5/10

LIGHTING EQUIPMENT AND PHOTOMETRIC TESTS

Society of Automotive Engineers, Inc.

1971 51p
Report no. SAE-HS-34

5/10 Lighting Systems (Cont'd.)

HS-011 971 (Cont'd.)

SAE standards, recommended practices, and information reports on vehicle lighting equipment and photometric tests are presented.

Search terms: Lighting standards; Vehicle lighting; Lamp standards; Lamp tests; Lighting tests; Headlamps; Taillamps; License plate lamps; Stop lamps; Fog lamps; Parking lamps; Cornering lamps; Turn signals; Backup lamps; Reflex reflectors; Lighting inspection; Flares; Flashing lamps; Photometry; Test equipment; Passing lamps; Spotlights; Signal lamps; Emergency lighting

AVAILABILITY: SAE

HS-011 972 Fld. 5/10; 5/18; 3/12

EFFECT OF VEHICULAR ROLL ON A POLARIZED HEADLIGHTING SYSTEM

by W.S. Adams

Published in *Highway Research Record* n377 p118-30 (1971)

8refs

Sponsored by Highway Research Board Committee on Visibility.

The prime objective of this study was to produce experimentally vehicular roll and to measure its effects on a group of test drivers. Results showed that: vehicular roll has an insignificant effect on detection distances and a minimal effect on subjective glare evaluations; the high-intensity polarized system significantly improves detection distances by 32% and reduces discomfort glare over the conventional high-beam headlighting system; the lateral position of the pavement marker target has a significant effect on detection distances. Targets located on the shoulder line provided 500 ft. of additional detection distance over the same target under the same conditions that were located on the centerline. These results support the use of pavement edge markings in roadway delineation.

Search terms: Polarized headlamps; Pavement markings; Pavement edge markings; Roll; High beamed headlamps; Glare reduction; Distance perception; Test tracks; Variance analysis; Centerline markings; Test drivers; Target detection; Raised pavement markings

5/11 Maintenance and Repairs

HS-011 973 Fld. 5/11

VEHICLE OPERATING COSTS IN 1970

by R.F.F. Dawson

Transport and Road Res. Lab. (England)

1972 13p 18refs
Report no. TRRL-LR-439

This report gives the latest version of the Laboratory's formulae for vehicle operating costs. The only change in the basis of the formulae is in the treatment of taxation: the fuel costs net of taxation have been multiplied by 1.14 to allow for the taxation element in the rest of the economy to or from which expenditure on fuel may be diverted. Formulae are given for the operating cost per kilometre for traffic of an average composition for different classes of vehicle and also for the cost including all taxation.

Search terms: Vehicle operating costs; Taxation; Time costs; Fuel costs; Depreciation; Vehicle maintenance; England; Vehicle characteristics; Speed

5/12 Manufacturers, Distributors, and Dealers

HS-011 974 Fld. 5/12; 5/21

AN INVESTIGATION OF ODOMETER ROLLBACK ACTIVITY

by S. Paulsrude

Washington Dept. of Motor Vehicles

1972 33p
Report no. RR-030

A study was conducted to determine the magnitude of automobile odometer rollback activity at a selected sample of used vehicle outlets, and a feasibility evaluation made of a field survey approach as a means for detecting and ultimately controlling this form of activity. A descriptive analysis was also performed to identify characteristics common to vehicles found to have odometer rollbacks and to relate these factors to the amounts of mileage discrepancy. Of the 87 vehicles and eight dealers included in the investigation, 20% of the vehicles and 75% of the retail outlets were determined to involve odometer rollbacks. Conclusions drawn are that the magnitude of the odometer rollback activity may be alarmingly high and poses a potentially serious threat to traffic safety and consumer protection; and that the survey and validation method described provides the department with a cost effective capability for detecting and dealing with this activity.

Search terms: Consumer protection; Dealers; Used automobiles; Vehicle mileage; Odometers; Vehicle sampling; Vehicle age; Vehicle identification numbers; Surveys; Vehicle characteristics; Fraud; Tampering

5/14 Occupant Protection

HS-011 975 Fld. 5/14

AUTOMOTIVE RESTRAINT SYSTEMS—DEVELOPMENT AND USE

by D.C. Lhotka

National Safety Council

1971 19p

Presented at Human Factors Society Symposium, New York, 21 Oct 1971.

The origin and history of seat belts are discussed and attempts to educate the public in the need for their use are reviewed. A discussion of seat belt usage and public apathy is presented. Possible approaches to the problem are offered: mandatory use laws, automatic seat belt devices, and increased promotional activities.

Search terms: Seat belts; Shoulder harnesses; Public information programs; Seat belt usage; History; Passive restraint systems

HS-011 976 Fld. 5/14

A LIMITED INVESTIGATION OF AUTOMOTIVE USED SEAT BELTS

by C.H. Melton; A.B. Castle, Jr.

National Bureau of Standards

1971 34p 10refs
Report no. NBS-10-538

A laboratory study of 82 severely used automotive seat belts was made to evaluate present standards and to suggest possible improvements. Areas of investigation included hardware tests and webbing degradation from sunshine, abrasion, and dirt. Both subjective and measurement evaluations were conducted. Confirmations, new data, and recommendations are presented. It is recommended that: buckle abrasion should supersede the hexagonal steel bar abrasion for this test for webbing in the Motor Vehicle Safety Standard No. 209; a thickness measuring gauge for determining abrasion of seat belt webbing should be considered for state safety lane inspection of automobiles; seat belts manufactured before the year 1964 (not meeting S.A.E. specification J4b) should be replaced since earlier webbing strength requirements were less than the present 6,000 lbf.

Search terms: Seat belt standards; Seat belt tests; Abrasion tests; Webbing; Corrosion; Seat belt assemblies; Thickness measurement; Seat belt buckles; Seat belt failures; Dirt; Wear

HS-011 977 Fld. 5/14

NEW PASSIVE RESTRAINT SYSTEMS

Anonymous

Published in *Automotive Engineering* v80 n8 p30-9 (Aug 1972)

This is a state-of-the art report based on the recent 2nd International Conference on Passive Restraints. The following topics are touched upon: automobile structures which can be built with substantially improved crash energy management characteristics; three approaches to air cushion systems; new developments in crash sensors; and advances in seat belt systems.

Search terms: Crashworthiness; Energy absorbing front structures; Air bag restraint systems; Sensors; Seat belt design; Three point restraint systems; State of the art studies; Safety device costs; Radar; Passive restraint systems

HS-011 978 Fld. 5/14

A CRITICAL REVIEW OF RADAR AS A PREDICTIVE CRASH SENSOR

by T.O. Jones; D.M. Grimes; R.A. Dork

General Motors Corp.

1972 40p 11refs
Report no. SAE-720424

Presented at 2nd International Conference on Passive Restraints, Detroit, 22-25 May 1972.

A general discussion is provided on crash sensor requirements with emphasis on the advantages of long inflation times. Several different text book varieties of candidate radar systems are described. An information and data processing analysis was conducted relative to crash sensor required information. The conclusion reached is that radar crash sensors will be unavailable for MY 1976 air cushion requirements.

Search terms: Sensors; Radar; Lasers; Performance characteristics; Reliability; Air cushions; Microwave systems; Barrier collision tests; Head on impact tests; Doppler effect; Air bag deployment forces; Hazard perception; Air bag inflation time; Air bag restraint systems; Safety device costs

AVAILABILITY: SAE

HS-011 979 Fld. 5/14; 1/2

AN ASSESSMENT OF ACTIVE AND PASSIVE RESTRAINTS IN SERIOUS INJURY EUROPEAN CAR OCCUPANT COLLISIONS

by G.M. Mackay

Birmingham Univ. (England)

Published in *AGARD Conference Proceedings n88* (AGARD-CP-88-71) 1971 p10-(1-11), 10-App. 1-1

13refs

Presented at the Aerospace Medical Panel Specialist Meeting, AGARD Conference on Linear Acceleration of Impact Type, Oporto, Portugal, 23-26 Jun 1971.

A field study of road accidents involving 105 vehicles selected from the severe and fatal injury end of the injury spectrum is reported. This sample of accidents is

5/14 Occupant Protection (Cont'd.)

HS-011 979 (Cont'd.)

representative in general terms of severe collisions to car occupants in current model European cars in Britain. The incidence of various crash configurations is outlined, together with the objects struck and the rate with which the passenger compartment is penetrated. The relative frequencies of side impacts, multiple, and complex collisions are described. Each collision is examined in terms of the likely reduction in injuries to front seat occupants which might be obtained if an airbag had been present or if a lap/diagonal seat belt had been worn. An overall judgment is therefore obtained on the relative benefits obtainable from airbags and belts. Belts are shown to be superior because they provide protection in a greater range of collision types. If a belt wear rate exceeding some 63% for drivers and 85% for front passengers were obtained, then belts provide greater benefits than airbags. The importance of intrusion into the passenger compartment is emphasized as a restriction on restraint effectiveness in present day European car designs.

> Search terms: Accident investigation; Accident studies; Air bag restraint systems; Restraint system effectiveness; Three point restraint systems; England; European vehicles; Impact angle; Impact severity; Crush distance; Damage severity; Accident types; Fatalities; Injuries by seat occupation; Injury severity; Driver injuries; Passenger injuries; Age factor in accidents; Head injuries; Chest injuries; Neck injuries; Abdominal injuries

5/15 Propulsion Systems

HS-011 980 Fld. 5/15

GAS TURBINE CARS ARE ON THE WAY

by J.P. Norbye

Published in *Autocar* v136 n3962 p4-6 (23 Mar 1972)

The Williams Research Corp. turbine follows the overall design principle for regenerative turbines, but differs in combustion chamber design. Williams uses a toroidal combustion chamber, with low-pressure fuel feed from the central shaft. Atomization of the fuel is assured by the air speed around the axis, and provides excellent uniformity of distribution. Fuel metering is part hydro-mechanical and part electro-mechanical. The desired air turbulence is assured by the shape, size, and angle of the diffuser orifices.

> Search terms: Gas turbine engines; Combustion chamber design; Fuel systems; High temperature; Engine operating conditions; Engine design; Gas turbine automobiles

5/17 Safety Defect Control

HS-011 981 Fld. 5/17

PRODUCT DEVELOPMENT ASPECTS OF MOTOR VEHICLE TESTING

by D.G. Stratton; J. Gallantree

Ford Motor Co. Ltd. (England)

Published in *Instrumentation and Test Techniques for Motor Vehicles,* 1967, p104-13

2refs

> Presented as Paper 12 at Institution of Mechanical Engineers Symposium.

Vehicle testing has the dual purpose of ensuring customer satisfaction and increasing engineering design experience and knowledge. Specific examples of tests, instrumentation, and analysis used in relation to vehicle durability, noise, ride and handling, heating and ventilating systems, and engine cooling systems are included. Importance of overseas testing to evaluate vehicle behavior in various environments is stressed. Production validation testing of vehicles built by production methods, prior to new model introduction date, is designed to ensure that performance specifications, vehicle reliability, and quality targets are satisfied. Quality control testing is designed to ensure that product objectives are maintained. Test methods are simple and results are interpreted on a go/no-go basis. Testing continues throughout the model life to assist in correlating warranty claims and customer complaints with the test methods used in product evaluation.

> Search terms: Test equipment; Measuring instruments; Performance tests; Vehicle performance; Vehicle noise; Acoustic measurement; Sound absorbing materials; Vehicle riding qualities; Vehicle handling; Ventilating systems; Heating; Temperature; Cooling systems; Air flow; Production control; Quality control; Steady state

5/18 Steering Control System

HS-011 982 Fld. 5/18

THE LABORATORY INVESTIGATION OF VEHICLE VIBRATION

by C. Ashley; B. Mills

Birmingham Univ.

Published in *Instrumentation and Test Techniques for Motor Vehicles,* 1967, p25-33

15refs

> Presented as Paper 4 at Institution of Mechanical Engineers Symposium.

Ride is generally considered to be the sum effect of the mechanically transmitted vibration due to the passage of an automobile. To evaluate vehicle ride the direct information which is required is the relation between the input vibration to the vehicle and its output vibration, this being known as the ride transfer characteristic, and is most easily obtained from a laboratory test installation where the vibration input can be controlled. This paper describes the electrohydraulic road simulator and the experimental techniques developed. This ride simulator at its present state of development is capable of giving information of direct value to ride engineers.

> Search terms: Vibration tests; Electronic vibrators; Vehicle stability; Random vibration; Ride simulators; Vibration response; Vehicle riding qualities; Laboratory tests; Vibration analysis; Acceleration response

HS-011 983 Fld. 5/18

THE SELECTION OF INSTRUMENTS AND RECORDING APPARATUS FOR VEHICLE TESTING

by J.R. Ellis; M.A. Perry

Advanced School of Automobile Eng. (England)

Published in *Instrumentation and Test Techniques for Motor Vehicles,* 1967, p80-94

6refs

> Presented as Paper 10 at Institution of Mechanical Engineers Symposium.

This paper describes the functions measured in the instrument systems developed for vehicle handling studies at the Advanced School of Automobile Engineering. The functions measured, and those ignored, are discussed; the importance of correct positioning and alignment and the corrections required when the optimum location is not obtained are mentioned. Arguments for the selection of particular units are put forward, and the development of an active low pass filter is described. Data recording and analysis are demonstrated.

> Search terms: Vehicle dynamics; Vehicle handling; Instrumented vehicles; Tire force measurement; Accelerometers; Gyroscopes; Galvanometers; Low pass filters; Acceleration; Pitch; Roll; Fourier analysis; Dynamic tests; Electronic monitoring systems; Recorders; Mathematical analysis; Measuring instruments; Angular acceleration

HS-011 984 Fld. 5/18

A DYNAMOMETER ON WHICH THE DYNAMIC BEHAVIOUR OF A PASSENGER CAR CAN BE SIMULATED

by J. Odier

Published in *Institution of Mechanical Engineers Proceedings* v186 n7/72 p87-96 (1972)

6refs

> Prepared for presentation at Institution of Mechanical Engineers Automobile Div., Coventry (England), 29 Feb 1972.

Development of a dynamometer to simulate the road-holding behavior of a passenger car is described. Various applications are discussed, including study of braking, traction, steering, and tire behavior.

> Search terms: Dynamometers; Tire traction; Braking; Steering tests; Vehicle dynamics; Tire force measurement; Test tracks

HS-011 985 Fld. 5/18

VEHICLE STEERING FUNDAMENTALS

by W.H. Baier

Published in *SAE Transactions* v69 p256-68 (1961)

15refs

Factors influencing steering are summarized and the part that each plays in determining the lateral motion of the vehicle as it travels along a curved path is pointed out. Steering angles determined in accordance with the Ackermann theory of divided axle steering must be modified to account for the effects of tire slip angle. In addition to tire forces, the vehicle is subject to aerodynamic and inertial forces. The effect of these forces and torques upon the basic Ackermann response is discussed. Included are discussions of various steering gear mechanisms such as the worm and sector, worm and roller, and worm and nut, the effect of steering errors introduced by incorrect steering geometry, and characteristics of steering phenomena such as low and high speed wobble.

> Search terms: Steering; Steering gear; Tire slip motion; Torque; Aerodynamics; Inertial forces; Wheel alignment; Steering wheels; Cornering; Roll; Steering force; Tire forces; Equations of motion; Wind; Vehicle handling

HS-011 986 Fld. 5/18; 4/7

DYNAMICS OF WHEELED VEHICLES. REPORT 4: A STATISTICAL ANALYSIS OF OBSTACLE-VEHICLE-SPEED SYSTEMS

by G.G. Switzer

Army Engineer Waterways Experiment Station

1972 64p 7refs
Report no. TR-M-68-1; AD-739 916

> Sponsored by U.S. Army Materiel Command

Approximately 300 tests were conducted with an M37 3/4-ton truck at various speeds over single obstacles of various heights and shapes. Data for acceleration-time history, vehicle speed and pitch angle, and event markings were recorded on FM analog tape, which was processed by an analog computer. The following parameters were determined

5/18 Steering Control System (Cont'd.)

HS-011 986 (Cont'd.)

(at the vehicle center of gravity) for each test: peak, root mean square, and mean root mean square values of vertical acceleration, and the vector sum of vertical and longitudinal acceleration components; and vehicle impact speed and average speed during obstacle traversal. Linear correlations of vehicle average speed with peak and statistical accelerations were determined by regression analysis.

Search terms: Truck tests; Vibration tests; Proving ground tests; Truck stability; Vehicle center of gravity; Vehicle dynamics; Angular acceleration; Lateral acceleration; Pitch; Statistical analysis; Computerized simulation; Analog computers; Data analysis; Mathematical models; Speed patterns; Acceleration response; Regression analysis; Vehicle riding qualities; Simulation models

AVAILABILITY: NTIS

5/22 Wheel Systems

HS-011 987 Fld. 5/22

RADIAL TIRE COMPOUNDING

by J.J. Leyden

Published in *Rubber Age* v104 n4 p51-3 (Apr 1972)

Based on a paper presented before the Akron Rubber Group, 22 Oct 1971.

Although some bias-belted tire compounds find their way into radial tires, for the most part new compounds have to be developed. In order to achieve and sustain high levels of performance, these compounds will normally contain higher quality, higher cost materials. As a result, in many instances, new mixing technologies have to be developed in order to obtain an optimal homogeneity among these materials, e.g., new polymer blends used in radial tire compounds. Various radial compounds and how they differ from compounds used on bias-belted tires are discussed.

Search terms: Radial tires; Tire materials; Bias belted tires; Polymers; Tire design; Tire sidewalls

HS-011 988 Fld. 5/22

FRICTION REQUIREMENTS FOR HIGH-SPEED PASSING MANEUVERS

by J.C. Glennon

Texas A and M Univ. Texas Transp. Inst.

1971 74p 2refs
Report no. RR-134-7; PB-207 336

Sponsored by Texas Hwy. Dept. in cooperation with the Federal Hwy Administration.

Tire-pavement friction demands were found by photographing and analyzing passing maneuvers performed under actual highway conditions. Critical frictional requirements are proposed for application to skidding accident prevention programs that incorporate minimum skid resistance levels and wet weather speed limits.

Search terms: Tire pavement interface; Friction studies; Skid resistance; Passing; Motion pictures; Lateral acceleration; Critical velocity; Mathematical analysis; Wet road conditions; Speed limits; Acceleration; Texas

AVAILABILITY: NTIS

HS-011 989 Fld. 5/22

ENGINEERING ASPECTS OF TYRE TESTING

by J.A. Turley

Published in *Institution of Mechanical Engineers Proceedings* v185 n74/71 p1003-14 (1970-71)

15p 11refs

Prepared for presentation at Institution of Mechanical Engineers, London, 30 Nov 1971.

The engineering performance expected of tires is analyzed in the context of the machines they fit. As the performance of vehicles depends on the reaction of their tires to speed, braking, driving, and steering forces, ways of measuring these forces and their effects using sophisticated tire testing machinery are essential to both tire and vehicle manufacturers. The tire testing facilities at Fort Dunlop are described with specific reference to the circulating power machine. This machine enables the study of the effects of both high speed and driving and braking torques on tires. One of the effects of large torques applied to tires is the cracking and chunking of the tread rubber, and evaluation of this is described. Various measurement techniques are employed and associated calibration methods have been developed which are applicable to many types of test machines.

Search terms: Tire tests; Tire characteristics; Tire performance; Tire test equipment; Tire loads; Tire deflection; Tire rolling resistance; Tire brake force; Steering force; Brake torque; Tire pavement interface; Tire wear; Tire force measurement

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 536 Fld. 3/6

BASIC TRAINING PROGRAM FOR DRIVER LICENSE EXAMINER. COURSE GUIDE

Technical Education Res. Center

1971 62p
Contract FH-11-7537

The course guide was prepared as an informational and resource aid to enable state administrators and program directors to plan, organize, and establish the management structure necessary to implement and conduct training programs for driver license examiners. This guide condenses the important elements of the training program by: outlining the basic program structure, scope, and objectives; listing trainee and instructor requirements; providing information concerning class scheduling, program structure, and facilities; and suggesting teaching techniques, aids, and resource materials.

Search terms: Driver license examiners; Curricula; Instruction manuals

AVAILABILITY: GPO $0.70

HS-800 577 Fld. 3/6

BASIC TRAINING PROGRAM FOR DRIVER LICENSE EXAMINER. INSTRUCTOR'S LESSON PLANS

Technical Education Res. Center

1971 296p 44refs
Contract FH-11-7537

To help the states economically implement effective driver license examiner training to develop needed manpower, NHTSA undertook the task of developing a basic training program. This volume contains guidelines on program presentation and a complete set of lesson plans.

Search terms: Driver license examiners; Instruction manuals; Curricula

AVAILABILITY: GPO $2.50

HS-800 578 Fld. 3/6

BASIC TRAINING PROGRAM FOR DRIVER LICENSE EXAMINER. TRAINEE STUDY GUIDE

Technical Education Res. Center

1971 87p refs
Contract FH-11-7537

This study guide was developed to help the prospective driver license examiner to learn more efficiently and effectively those skills necessary to perform duties related to driver licensing. Part 1 discusses some suggestions for preparation for the lessons to be covered in the training program. These suggestions also include methods and techniques of study to aid in the preparation for the lessons. Part 2 contains lesson study sheets, one for each lesson in the training program. These sheets include the lesson topic, the lesson objectives, references to be consulted in study, and specific study suggestions for that lesson.

Search terms: Driver license examiners; Instruction manuals; Curricula

AVAILABILITY: GPO $1.00

HS-800 697 Fld. 5/4

REAR END STRUCTURAL CRASHWORTHINESS OF PERIMETER FRAME VEHICLES. DESIGN, DEVELOPMENT AND VERIFICATION. FINAL REPORT

by R.L. Anderson; E. Enserink

Dynamic Science

1972 293p
Contract FH-11-7604; DOT-HS-046-2-264
Report no. 2310-72-18

Report for Jul 1970-Jul 1972.

The objective of this program was to develop a rear end structure with improved crash energy control characteristics for late-model perimeter frame American-built automobiles. Baseline impact tests were conducted to determine the performance characteristics of conventional automobiles in rear end impacts and to provide a basis for later evaluation of the modified vehicles. Scale model dynamic tests were conducted in a parametric study of various energy management concepts. Two basic designs were investigated in a series of full-scale development tests. These development data were used to modify and finalize the selected design. Three vehicles were built and tested in vehicle-to-vehicle impacts which verified that the rear end design satisfied the program objectives.

Search terms: Energy absorbing rear structures; Crashworthiness; Crashworthy bodies; Test equipment; Barrier collision tests; Angle impact tests; Vehicle vehicle impact tests; Accelerometers; High speed photography; Automobile modification; Frame design; Dynamic tests; Energy absorption; Impact velocity; Scale models; Crush distance; Displacement; Acceleration; Low speed impact tests; High speed impact tests

AVAILABILITY: NTIS

NHTSA Staff Speeches, Papers, etc.

HS-810 228 Fld. 3/1

CITIZEN SUPPORT FOR HIGHWAY SAFETY ALCOHOL COUNTERMEASURES

by Charles H. Hartman

National Hwy. Traf. Safety Administration

1972 11p

Presented at Alcohol Countermeasures Forum for Women Hwy. Safety Leaders, Michigan State Univ., 6 Sep 1972.

It is held that there can be no permanent, total solution to the problem of highway safety until we do something about the habitually drunken driver. Needed is a nationwide effort on alcohol countermeasures with public support. In order to gain public acceptance and

NHTSA Staff Speeches, Papers, etc. (Cont'd.)

HS-810 228 (Cont'd.)

support for highway safety, there must first be an informed public knowledgeable about the whys and wherefores of highway safety. Government is typically less well positioned for, and less capable of, generating effective public information than private sector groups. The news media and advertising are public education activities that are effective in this regard.

Search terms: Alcohol education; Highway safety programs; Driver intoxication; Speeches; Drinking drivers; Community support

AVAILABILITY: NHTSA

HS-810 231 Fld. 3/1

REMARKS AT THE ANNUAL CONVENTION OF KEMPER INSURANCE, CHICAGO, ILLINOIS, SEPTEMBER 14, 1972

by C.F. Livingston

National Hwy. Traf. Safety Administration

1972 6p

The Department of Transportation's plans for field testing Alcohol Screening Devices (ASDs) are outlined. These devices are portable, automatic breath testing units for measuring the blood alcohol concentration (BAC) of drivers at the roadside.

Search terms: Drinking drivers; Driver intoxication; Intoximeters; Blood alcohol levels; Field tests

AVAILABILITY: NHTSA

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We will be pleased to announce in HSL your research paper or research report not previously announced in this journal. The material must be directly related to Highway and/or Motor Vehicle Safety and must fall within the scope of the Table of Contents – Subject Fields and Groups.

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